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Utilization of village/panchayati ponds for aquaculture in the Barnala district of Punjab- A case study

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Abstract

Globally, the growth of fisheries sector in its production is mainly due to the contribution of aquaculture sector. The development of aquaculture is due to the intensification of culture practices, horizontal (increase of area) and vertical expansion (polyculture, species enhancement) of fish farming. Along with the culture of fish in private ponds, people with less/ no land holdings, are utilizing the village/ panchayati ponds for adopting fish farming as a source of income to uplift their socio-economic status. They used to follow good management practices to maintain water quality standards, ensures the primary productivity of pond by applying manures (cow dung, poultry droppings or bioslurry), provide good quality supplementary feed and regular use of lime and other disinfectants (potassium permanganate, CIFAX) for the prevention of disease occurrence. This paper provides an overview about the role of village ponds in enhancing the area under fish farming in the Punjab state and few success stories of fish farmers of district Barnala practicing fish farming in the village/panchayati ponds.

Key words: Aquaculture, Environment, Income, Punjab, Village ponds

Introduction

In the year 2019-20, total fish production of India was 14.16 MMT (million metric tonnes) (141.64 lakh tonnes), out of which contribution of inland sector was 73.66 % by producing 10.43 MMT (104.37 lakh tonnes) fish (Handbook on Fisheries Statistics, 2020). Since 2010, the production by marine capture sector has reached a stagnant phase whereas, the annual increase in the fish production is due to the culture sector. India ranks second in the aquaculture after China in which major contribution is of the freshwater aquaculture which is possible only because of the production from inland states (Handbook on Fisheries Statistics, 2020; FAO, 2020). Aquaculture provides safe, nutritious, and sustainable aquatic food for the consumers worldwide. Globally, aquaculture production must double by 2030 to keep pace with the increasing demand of animal protein (FAO, 2020).

Since last 4 decades, Punjab fisheries sector has grown tremendously, with a fish production of 2800 tonnes in 1980-81 and 1.51 lakh tonnes in 2019-20. Out of the state's total production, contribution of culture sector is more than 60% whereas rest is the catch from rivers, lakes, streams, wetlands etc. Along with the fish production, the state has produced 2642.35 lakhs fry in the year 2019-20 (Handbook on Fisheries Statistics, 2020). In carp farming, Punjab farmers are getting the highest productivity in the country.

Horizontal expansion of aquaculture

According to the Punjab State Fisheries Department, in the year 2016-17, total area under aquaculture was 16,226 hectares (ha). Out of the total area under pisciculture, 14,551 ha (89.67 %) area was of village ponds whereas remaining 2,474 ha (10.32 %) was of private ponds. It clearly shows that a major share of fish production in the state is from the village ponds. In Punjab, a total of 12,673 residential villages are there where approximately 15,000-20,000 village ponds are present (number vary according to various reports). Among these, only 8,794 ponds are presently under aquaculture practice (Ansal and Kaur, 2019) whereas rest are still being utilized for collecting rain water, cleaning the cattle or for discharging village waste water. All these factors contribute towards making the water less/un-productive and even make the path for the origin of various water-borne diseases among the natives and animals.

Farmers have historically relied on horizontal growth or expansion *i.e.*, increasing farm size or area as a strategy to improve their financial positions. For the horizontal growth of aquaculture, more land area should be brought into utilization under fish farming (Singh and Singh, 2017). In regard to this, village ponds are the potential aquatic resources that can be utilized for income generation through aquaculture. People with no or less land can take village ponds on lease for fish farming.

Other states of the country such as Karnataka and Assam are having small and plenty number of village ponds with great potential for aquaculture but are still being used for irrigation purpose and under-utilized for aquaculture (Adarsha *et al.,* 2020). Alike the village ponds of Punjab state, these resources are portrayed by good amount of fish production, managing by single labor, potential for integrated farming and supplementary income. Marginal farmers of these states with lesser landholdings where farm ponds and water storage ponds are of smaller area but still are not in use. Bringing these small ponds under use of aquaculture can provide additional income (along with the traditional farming practice) to the rural people and farmers which will assist their livelihood in enhancing food and nutritional security, and generating employment in the rural areas (Manjappa *et al.,* 2017). In Assam, a pilot project was conducted with a group of resource poor tribal farmers and the reports revealed that the village ponds can be utilized for fish farming by utilizing the locally available natural resources and can go for integration also. This infers an excellent opportunity for upgrading the rural economy through the growth and expansion of small-scale fish culture enterprises (Das, 2006). This clearly reveals the potential of village ponds for enhancing the fish production of the nation through aquafarming.

1. Benefits of utilizing village ponds

In the Punjab state, some village ponds were cleaned and revitalized to bring them into use for irrigating the village land and crops by the initiative of Department of Soil and Water Conservation of the state. With the help of panchayat funds and donations and village peopleôs co-operation, the task of completely parching the pond and removing silt from the polluted village ponds has been taken up (Chaba, 2020). The rejuvenated ponds can be brought into utilization for fish culture and it would be beneficial in 3 ways *i.e.*,

*Firstly, it will keep the surroundings clean as the village ponds can be a source of origin of various water borne diseases for human beings as well as for animals.

*Secondly, it helps in utilizing the waste-collecting village ponds for income generation for the unemployed youth and farmers.

*Thirdly, the income generated through the lease amount can be utilized for the development of village by the panchayats.

2. Possible remedies for treating village pond water

According to a recent report by the DoECC, Department of Science, Technology and Environment, GoP (2020), an aggregate of 15,466 rural and 249 urban ponds have been identified in the state. The nutrient loading from run-off from nearby agrarian areas, disposal of waste, infestation by aquatic weeds, encroachment, etc. are the other main pitfalls to the village ponds. For the restoration, conservation and management of ponds, site specific conditions should be kept into consideration as these ponds play a pivotal role in water conservation, climate change adaptation and biodiversity habitat conservation.

Village ponds were initially utilized for the waste-water collection, cattle bathing etc. but now a days, people are more aware about the importance of hygiene for the human health. Complete dewatering, ploughing, liming need to be done in the village for making it suitable for the fish culture and in case of large area and in-sufficient funds, dewatering is not possible. In such cases, depending on the pollutant load and type of contaminants, phyto-remediation can be done for the cleaning of village ponds.

An environment friendly bio-remediation process to remove excessive amount of nutrients and pollutants from any environment by the use of any natural green plant-based system is called as Phyto-remediation. This technique not only saves the energy but is also a fruitful approach in recovering the polluted and waste resources biologically by using aquatic plants with fast growing potential and high nutritive value. For the phytoremediation technique, Duckweeds act as excellent candidate plant group capable of recovering or extracting nutrients or pollutants from the wastewater (Ansal *et al.,* 2010). These are prolific plants which grow very fast by extracting nutrients from the wastewater yielding cost effective protein-rich biomass as a by-product. Besides nutrient extraction, other advantages of duckweeds reveal that they are capable to significantly reduce the content of total suspended solids, biochemical oxygen demand (BOD), and chemical oxygen demand in wastewater (Gupta *et al.,* 2013). These can be easily used as

mulch or a natural soil organic enrichment.

Duckweeds possess a speedy growth and immense potential for being used as animal feed or fodder as well as for nutrient recovery from polluted aquatic systems (Ansal *et al.,* 2020). This plant group has a good edibility, effective nutrient rooting credential, high nutritional content and the harvesting is very easy as well (Leng, 1999). This waste-water treatment technique is very simple to operate and during the operation, excess biomass of duckweed needs to be continuously removed to encourage the continued growth of duckweed. It is a cost and labor effective method of waste-water treatment as it can be implemented at either the individual farm or community levels (UNEP-IETC, 1998). Experimental study by Chawla et al. (2001) suggested that the refurbishment and utilization of village ponds will have an encouraging effect on the rural market and will improve the environment and also replenish the ground water regime in the regions with declining water table crisis.

3. Initiatives by the state government for village ponds restoration

· In 1956, the first step towards utilizing the village ponds area under aquaculture was taken. While the first 5 yearsô plan was in action, in the 3 districts of Punjab *i.e.*, Hoshiarpur, Gurdaspur and Amritsar, a scheme was introduced for the stocking of village to enhance the food fish production (PSFDB).

· In the year 1966, a project was initiated to revive the polluted village ponds with the main objective of amplifying the scope and importance of fisheries (PSFDB).

· In the state, for the bio-remediation of village ponds, a pilot project was initiated by the State Government in 2001 based on the duckweed technology. This bio-remediation project was initiated with the collaborative efforts of Punjab State Council for Science and Technology (PSCST) and village ponds of Sanghol and Chanarthal Kalan in Shri Fatehgarh Sahib district were chosen (Singh *et al.,* 2003) which were further divided into 2 units *i.e.,* duckweed pond and pisciculture pond. After 30-40 days of phyto-treatment, water which was remediated was collected from the duckweed pond and utilized in the fish pond for rearing the fish and the harvested biomass of duckweed was used as fish feed. It is remarkable that Punjab state government was the first one to initiate such state-level projects for reviving village ponds harnessing the duckweed technique (PSCST, 2002; Ansal *et al.,* 2010). Remarkable results of the conducted project have led to the continuation of the project.

After the successful execution and completion of first duckweed pilot project in the village ponds of Punjab, an additional project was taken up in 2003 by PSCST in the village Sandhua in the district of Ropar followed by many others (Ansal *et al.,* 2010). An Indian based social service association called ósulabh Internationalô maintained and operated the project in the early years. But later, the Gram Panchayat of the villages took over the work (Ansal *et al.,* 2010).

· In 2020, The Government of Punjab has launched Mission Tandurast Punjab to make Punjab a healthy State with healthy people by ensuring the quality of air, water, food and a good living environment. Technological options of different models of Waste Stabilization Pond for the treatment of wastewater in villages include.

(i) Anaerobic Pond followed by Facultative and Maturation Pond
(ii) Anaerobic Pond followed by Reed Bed + Maturation Ponds
(iii) Anaerobic Pond followed by Facultative Aerated Lagoon + Maturation Ponds
(iv) Anaerobic Pond followed by Facultative Pond and Disposal onto Land for Irrigation as per Karnal Technology (DSTE-GOP, 2020)

4. Success Stories of Barnala District

Mr. Lovepreet Singh S/O Late S. Charan Singh of village Badbar of District Barnala, Punjab is practicing fish farming in village ponds in an area of 15 acres. He is having a wide experience of more than 15 years in this practice. In the year 2006, his father had started doing fish farming in the village ponds but after his demise, he has taken over the fish farming practice. He is doing fish farming scientifically in 2 production ponds and 1 nursery pond and manages the 15-acre fish farm with the help of one full time labor. He follows best management practices at his farm for maintaining the water quality, plankton production, health management practices for producing healthy and disease-free fish production. From the total area, he gets productivity of 3.0 tonnes/acre/year and annually earns a net profit of 12-15 lakhs per year. He has set an example for the youth that problems can never stop a hardworking person. All you need is to think positive and move ahead.

S. Sukhpal Singh S/O S. Chand Singh of village Badbar has been able to break the wheat-paddy crop cycle by adopting fish farming in village pond of 4.0

Plate 1: Unused and polluted village ponds

Plate 2: Village ponds being utilized under fish farming in the Barnala district of Punjab

acre in 2017. Along with that, he owns a private production pond of 2.5 acre and a small nursery pond for rearing of fish fry to fingerling stage. Annually, he spends nearly Rs 3-4 lakhs on seed, feed, medicines, labour, electricity and other miscellaneous expenditures. In the initial years, he earned a net profit of over Rs 10 lakh per year. With time and experience, now he is earning Rs. 12-13 lakh net profit per year by producing 2.5-3.0 tonnes of fish per acre. His story is inspiration for others to adopt fish farming as a venture for income generation.

S. Sukhjit Singh of village Kattu of district Barnala is doing fish farming in village ponds of 11.0-acre area with an experience of more than 10 years. He has taken the village ponds on lease in a group of 5 persons. They share the input cost, work load and

revenue cost. To initiate fish farming in the village ponds, they have cleaned the pond by dewatering and followed all the pre-stocking management practices for the preparation of old pond. They have dried the whole pond, done ploughing and disinfected the pond with lime to prevent the stock from disease occurrence.

Conclusions

*In Punjab, water resources in the form of village ponds forms a wide area with great potential for fish farming. After proper cleaning and restoration of village ponds either by dewatering, phyto-remediation or by any other wastewater treatment technology, village ponds are brought into use for fish farming which directly results in the horizontal expansion of aquaculture and income generation.

*Along with the monetary benefits, it is also beneficial in keeping the surroundings and environment clean. The polluted village ponds are basically under use for collecting rain water, bathing of cattle, village waste water collection which keeps the surroundings unhygienic for the living beings.

*Village ponds in Punjab are of larger area and these water bodies can make a huge increase in the fish production. These should not remain under-utilized and optimum utilization of these water resources should be made for the enhancement of fish production of the state and nation.

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